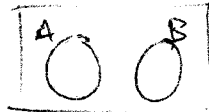


NAME: _____

Key

Probability Rules Review- 3



1. If $P(A) = 0.68$ and $P(B) = 0.13$ and $P(A \cap B) = 0.07$, find the following:

a. $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.68 + 0.13 - 0.07 = 0.74$

b. $P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.07}{0.68} = 0.1029$

- c. Are A and B disjoint events? Why or why not?

No. $P(A \cap B) \neq 0$

- d. Are A and B independent? Why or why not?

$P(A \cap B) = P(A) \cdot P(B)$
 $0.07 \neq (0.68)(0.13)$

NO!

2. If $P(D) = 0.25$, $P(C) = 0.33$ and D and C are disjoint, what is the probability of D or C?

$P(D \cup C) = P(D) + P(C) = 0.25 + 0.33 = 0.58$

3. If $P(K) = 0.60$, $P(R) = 0.30$ and K and R are independent, what is the probability of K and R?

$P(K \cap R) = P(K) \cdot P(R) = 0.18$

4. If $P(F) = 0.45$ and $P(H) = 0.21$ and $P(H|F) = 0.14$, find the following:

a. $P(F \text{ and } H) = P(F) \cdot P(H|F) = (0.45)(0.14) = 0.063$

b. $P(F \cup H) = P(F) + P(H) - P(F \cap H) = 0.597$

- c. What is the complement of F?

$1 - P(F) =$

0.55

- d. What is the complement of H?

$1 - P(H) =$

0.79

5. Let the sample space, $S = \{\text{all whole number from 10 through 30}\}$
 Let the event $A = \{10, 15, 20, 25, 30\}$
 Let the event $B = \{10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30\}$
 Let the event $C = \{11, 13, 15, 17, 19, 21, 23, 25, 27, 29\}$

Find the following:

a. $A \cap B = \{10, 20, 30\}$

b. $P(A \cap B) = \frac{3}{21}$

c. $C^c = \{10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30\}$

d. $P(A \cap C) = \frac{2}{21}$

e. $P(B \cap C) = 0$

f. $P(B^c) = \frac{10}{21}$

g. $C \cup B = \{10, 11, 12, 13, \dots, 28, 29, 30\}$

For the next question, put the probability statements into notation to help you.

6. On a certain day, there is a 41% chance for snow. The probability of Sue remembering to bring her scarf & gloves to work and it snowing is 30%. What is the probability that it ~~snows~~ given that ~~Sue remembering to bring her scarf & gloves to work?~~ *it snows?*
she brings gloves

$P(S_n) = 0.41$

~~$P(S_c \cap S_n) = 0.30$~~

$P(S_c \cap S_n) = 0.30$

$P(S_c | S_n) = ?$

$P(S_c | S_n) = \frac{P(S_c \cap S_n)}{P(S_n)}$

$= 0.732$

7. Out of 50 students in an organization, how many ways can we choose a executive committee of 5 students?

$50 nCr 5 = 2,118,760$

8. There are 60 people that have entered a raffle drawing. There are 3 prizes being given out (\$1000, \$500, \$10). How many different ways can this be done?

$$60 \text{ nPr } 3 = 205,320$$

9. Titan Council has 100 members in it. We want to create an executive board, made up of officers and a council. First we choose a President, VP, Secretary and Treasurer ~~first~~. After these have been chosen, we choose the council of 10 people. How many ways can this be done?

$$(100 \text{ nPr } 4)(96 \text{ nCr } 10) = 1.062 \times 10^{21}$$

10. For the lottery, there are 50,000 people that play. There is 1 grand prize of \$30,000, 15 second place prizes \$1000, 25 third places prizes of \$250 and 30 fourth place prizes of \$50. It costs \$3 to play the lottery.

- a. Create a probability model for the GAIN for each player

X	\$29,997	\$997	\$247	\$47	<u>Lose</u> -\$3
P(X)	$\frac{1}{50,000}$	$\frac{15}{50,000}$	$\frac{25}{50,000}$	$\frac{30}{50,000}$	$\frac{49,929}{50,000}$

- b. What is the expected gain for each player?

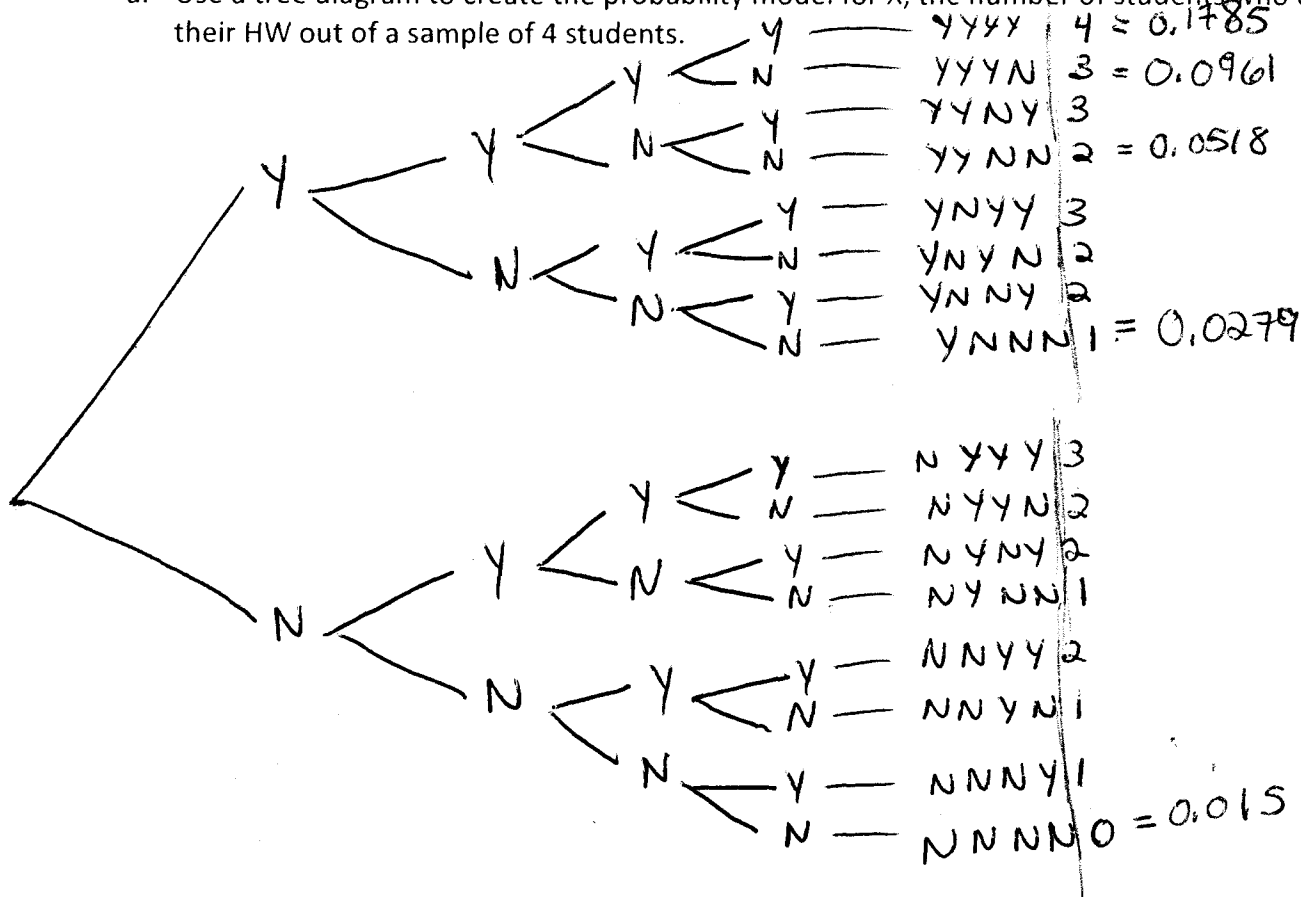
$$E(X) = \cancel{-1.945} - 1.945$$

- c. If a player plays the lottery 50 times, what is their expected total gain?

$$\cancel{-1.945} \times 50 = -97.25$$

11. Suppose that in a math class, 65% of the students do their HW on a nightly basis.

- a. Use a tree diagram to create the probability model for X, the number of students who do their HW out of a sample of 4 students.



- b. What is the probability that there will be exactly 3 students that did their HW last night?

$$P(X=3) = 0.3844$$

- c. What is the probability that at least 2 students did their HW last night?

$$P(X \geq 2) = 0.8737$$

- d. What is the probability that less than 2 students did their HW last night?

$$P(X < 2) = 0.1266$$

- e. What is the probability that no one did their HW last night?

$$P(X=0) = 0.015$$

- f. What is the probability that everyone did their HW last night?

$$P(X=4) = 0.1785$$

X	0	1	2	3	4
P(X)	0.015	0.1116	0.3108	0.3844	0.1785